

"branch prediction" + confidence + (value OR level)

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... at their maximum values, and hierarchical prediction would have been of no real **value**. ... if counter ranges were broken into several intervals, a different **confidence level** being attached ... This paper studied the accuracy of **branch prediction** methods proposed elsewhere as well as ...

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[Dynamic branch prediction with perceptrons](#)

DA Jiménez... - High-Performance Computer Architecture ..., 2001 - ieeexplore.ieee.org
... By contrast, two-level PHT schemes like gshare can learn any Boolean function if given enough training time ... N perceptrons in fast SRAM, similar to the table of two-bit counters in other **branch prediction** schemes ... Special circuitry computes the **value** of y and performs the training ...

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[Assigning confidence to conditional branch predictions](#)

E Jacobson, E Rotenberg... - ... of the 29th annual ACM/IEEE ..., 1996 - dl.acm.org
... Each such point defines a pair of high and low **confidence branch prediction** sets. ... 3. One **Level** Dynamic **Confidence** Mechanism(s). ... Our preliminary studies also indicate that indexing with a global CIR is of little **value** -- it gives low performance when used alone and typically ...

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[Selective value prediction](#)

B Cukier, Q. Rahman... - ... , 1999 - ieeexplore.ieee.org
... A predicted **value** should only be used if the **confidence** associated with that **value** is above a ... We examined several forms of **confidence** prediction and based our predictors on the **confidence** estimation techniques developed for **branch prediction** and multiple ...

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[Accurate indirect branch prediction](#)

K Driesen... - ACM SIGARCH Computer Architecture News, 1996 - dl.acm.org
... In analogy with the &hare predictor used in conditional **branch prediction** [CHP95], we can reduce the ... In a two-level predictor, this part contains the lower order branch address bits ... The hybrid predictor selects the target with the highest **confidence value**; ties are resolved using a ...

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[Efficacy and performance impact of value prediction](#)

B Ryntek, J Faust, B Krug... - Parallel Architectures and ..., 1998 - ieeexplore.ieee.org
... **Branch prediction** allows the processor to temporarily ignore dependency edges in the control flow graph when scheduling instructions for execution. ... Second-level table entries contain a tag, the prediction **value**, and **confidence** count. ...

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[Highly accurate data value prediction using hybrid predictors](#)

K Wang... - Proceedings of the 30th annual ACM/IEEE ..., 1997 - dl.acm.org
... Nevertheless, it is worthwhile to take cues from the vast body of research on **branch prediction**. ... respectively to the (i) last outcome scheme, (ii) last outcome scheme with **confidence** indicator, (iii) stride scheme, (iv) 2-level scheme (with PHT counter threshold **value** 3), (v) 2 ...

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[Trace processors](#)

E Rotenberg, G Jacobson... - ... , Thirtieth Annual IEEE ..., 1997 - ieeexplore.ieee.org
... at the granularity of traces can yield as good or better overall **branch prediction** accuracy than ... The **confidence** mechanism is a 2-bit saturating counter stored with each pattern in the ... Accuracy of context-based **value** prediction is affected by timing of updates, which we accurately ...

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[Confidence estimation for speculation control](#)

Q. Grubwald, A. Klausner, G. Manne... - ACM SIGARCH Computer ..., 1998 - dl.acm.org
... If the **branch prediction** is of "low **confidence**", the processor may switch to another available thread ... ZLC/CL[~] + ZLC, the probability that the branch is incorrectly predicted if it was low **confidence**. A high **value** for $P[Z|X]$ indicates that the processor can switch contexts only when ...

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[Neural methods for dynamic branch prediction](#)

DA Jiménez... - ACM Transactions on Computer Systems (TOCS), 2002 - dl.acm.org
... Recent efforts to improve **branch prediction** focus primarily on eliminating aliasing in two-level adaptive ... By contrast, traditional two-level adaptive schemes use pattern history tables (PHTs), which are ... of weights (which are learned through training) to produce an output **value** ...

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TY Yeh... - Proceedings of the 24th annual international ..., 1991 - dl.acm.org

... diction schemes were simulated on the SPEC bench- mark suite. By using Two-**Level** Adaptive Training **Branch Prediction**, the average prediction **accuracy** for the benchmarks reaches 97 percent, while most of the other schemes achieve under 93 percent. ...

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[Alternative implementations of two-level adaptive branch prediction](#)

TY Yeh... - ACM SIGARCH Computer Architecture News, 1992 - dl.acm.org

... tions, and use these costs in evaluating their relative ef- fectiveness. We measure the **branch prediction accuracy** of the three variations of Two-**Level** Adaptive **Branch Prediction**, along with several other popular proposed dynamic and static prediction schemes, on the SPEC ...

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... The least variation was in the ADVAN program in which the counters were virtually always at their maximum values, and hierarchical prediction would have been of no real **value** ...CONCLUSIONS This paper studied the **accuracy** of **branch prediction** methods proposed ...

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[Using hybrid branch predictors to improve branch prediction accuracy in the presence of context switches](#)

M Evers, PY Chang... - ACM SIGARCH Computer Architecture ..., 1998 - dl.acm.org

... one; otherwise, the **value** is decremented by one. By keeping more history information, a higher **level of branch prediction accuracy** can be attained [14]. Yeh and Patt proposed the Two-**Level** Branch Predictor which uses two levels of history to make branch pre- ...

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[Improving branch prediction accuracy by reducing pattern history table interference](#)

PY Chang, M Evers... - International journal of parallel ..., 1997 - Springer

... To improve prediction **accuracy**, various **branch prediction** strategies have ... The lower bits of the branch address select the appropriate Pattern History Table (PHT) and the **value** in the branch history register (BHR) selects the appropriate 2-bit counter to use within that ...

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[Improving the accuracy of dynamic branch prediction using branch correlation](#)

ST Pan, K So... - ACM SIGPLAN Notices, 1992 - dl.acm.org

... is 2N-1, it remains at that **value** as long as the branch is taken. ... is reported to produce a fairly high prediction **accuracy** [10]. Its hard- actual result: 1=taka, 0=not taken ... our knowledge, very little work has been done in addressing the issue of branch correlation in **branch prediction** ...

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[Dynamic history-length fitting: a third level of adaptivity for branch prediction](#)

T-Juan, S Sankaranarayanan... - ACM SIGARCH Computer ..., 1998 - dl.acm.org

... of lost cycles due to speculative execution of wrong-path instruc- tions, **branch prediction** has evolved ... Finally, prediction **accuracy** for gee, go and vorrex improves with more history bits but ... based on the current number of mispredictions and the minimum **value** encountered so far ...

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[Accurate static branch prediction by value range propagation](#)

JRC Patterson - ACM SIGPLAN Notices, 1995 - dl.acm.org

... Although these approaches are much better than trivial heuristics, their **accuracy** is still only mediocre. ... There is a **strong** similarity between constant propagation and our ... The objective of any **branch prediction** algorithm is to determine the likelihood of taking each conditional ...

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[Highly accurate data value prediction using hybrid predictors](#)

K Wang... - Proceedings of the 30th annual ACM/IEEE ..., 1997 - dl.acm.org

... ructural hazards and increased execution time [9]. In this section, we describe techniques that substantially improve the **accuracy** of data ... However, it is not possible to directly apply these techniques to data **value** prediction, because **branch prediction** involves merely a ...

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[\[PDF\] Combining branch predictors](#)

S McFarling - 1993 - utdallas.edu

... to both distinguish which of the two branches is being executed and what the current **value** of j ... Thus, the prediction **accuracy** here would be as good as that of local prediction. Figure 7 compares the performance of the global prediction with local and bimodal **branch prediction** ...

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E Sprangle, RS Chappell, M Atsuji... - ACM SIGARCH Computer ..., 1997 - dl.acm.org

... The link between changes in **branch misprediction** rate and changes in performance has been well documented [1 ... that a two-level branch predictor can achieve high levels of branch prediction **accuracy** [4]. In ... The first **level** function was originally the **value** of an N-bit shift register ...

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The potential of data value speculation to boost lp

J Gonzalez... - ... of the 12th international conference on ..., 1996 - dl.acm.org

... This particular benchmark has the highest **branch misprediction** rate, and its performance seems to be determined by such branches. ... G. Tyson and T. Austin, "Improving the **Accuracy** and Per ... "Highly Accurate Data **Value** Prediction using Hybrid Predictors", In Proc. of Int. Symp. ...

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Cycle approximate retargetable performance estimation at the transaction level

Y Hwang, S Abd... - Proceedings of the conference on Design, ..., 2008 - dl.acm.org

... Speed and **accuracy** are natural concerns ... basic block on the execution model in the PUM while assuming optimistic cache behavior of 100% hit rate and no **branch misprediction**. ... returns the set of operations that are in their last stage and have remaining cycle counter **value** of 0 ...

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Selective value prediction

B Calder, Q Rahman... - ... 1999. Proceedings of the ..., 1999 - ieeexplore.ieee.org

... tection of a fault, TLB miss, **branch misprediction**, or load misspeculation. ... prediction entry in the **value** table contains an N-bit history register, keeping track of the **accuracy** of the ... makes will most likely be incorrect, and the confidence counter will end up set to a **strong** not predict ...

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The bi-mode branch predictor

CC Lee, ICK Chen... - ... 1997. Proceedings... Thirtieth ..., 1997 - ieeexplore.ieee.org

... for each benchmark, we present results using the configuration that yields the best **accuracy** for the ... In Figure 2, the vertical axis represents the **branch misprediction** rate, and the horizontal axis ... Ideally, the index should generate highly biased substreams so that the **value** of the ...

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Compiler controlled value prediction using branch predictor based confidence

E Larson... - Proceedings of the 33rd annual ACM/IEEE ..., 2000 - dl.acm.org

... a function of this critical path metric, optimization frequency, and optimization **accuracy** ... to the fixup code where the computation proceeds with the non-speculative **value**. ... This approach introduces unnecessary **branch misprediction** when the branch predictor directs instruction ...

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The cascaded predictor: Economical and adaptive branch target prediction

K Driessens... - Proceedings of the 31st annual ACM/IEEE ..., 1998 - dl.acm.org

... branches, we believe that it could also improve conditional branch prediction and **value** prediction, ... a total of 288 prediction table entries achieves virtually the same prediction **accuracy** as the ... Interference for 24-bit pattern Table 2. Indirect **branch misprediction** causes for a BTB ...

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Fast path-based neural branch prediction

DA Jiménez... - 2003. MICRO-36. Proceedings. 36th Annual ... 2003 - ieeexplore.ieee.org

... **Branch misprediction** latency is the most important component of performance degradation as microarchitectures become ... a prediction is needed, the weights vector corresponding to that **value** of $xy \dots$ of $qrstv$, they can be bitwise complemented with very little impact on **accuracy**. ...

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Pipeline gating: speculation control for energy reduction

S Marinic, A Klauser... - ACM SIGARCH Computer ..., 1998 - dl.acm.org

... by running the program through a branch prediction simulator and recording the **branch misprediction** rate of ... The results for McFarling with JRS are similar to those using the "Both **Strong**" estimator. ... far less expensive to target a high SPEC **value** and increase the **accuracy** of the ...

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Trading conflict and capacity aliasing in conditional branch predictors

P Michaud, A Seznec... - ACM SIGARCH Computer Architecture ..., 1997 - dl.acm.org

... Recent studies have shown that large or multi-process workloads with a **strong** OS component ... we quantify aliasing and assess the effect of conflict aliasing on overall branch-prediction **accuracy**. ... bits and global history bits are XORed together to form an index **value**', whereas in ...

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... predictors in Section 3.1.1, it can be seen that there are **strong** similarities. ... eg, knowledge about the program exe- cuting) can always be used to improve the prediction **accuracy** ... The vertical axis indicates **branch misprediction** rate, and the horizontal axis indicates the size of pre ...

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... Recent studies have shown that large or multi-process workloads with a **strong** OS component exhibit very high degrees of aliasing [11, 51], and require much larger predictor tables than previously ... in last two of Table The 2-bit counter gives prediction **accuracy** an unaliased ...

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R Rakvic, B Black... - ACM SIGARCH Computer Architecture..., 2000 - dl.acm.org

... The experimental data implies that there is **strong** path locality, and that the example shown in ... The TMP performs multiple branch prediction relying on the **accuracy** of individual tree-node ... with the oldest completed block not in the previous trace, or after a **branch misprediction** ...

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... **Branch misprediction** latency is the most important com- ponent of performance degradation as microarchitectures ... Sec- ond, **accuracy** is improved because the predictor incorpo- rates path information into ... weights are kept closest to the logic that computes the **final** qrv value for ...

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... outcome but the selected counter of the direction predictors makes a correct **final** prediction ... each benchmark, we present results using the configuration that yields the best **accuracy** for the ... In Figure 2, the vertical axis represents the **branch misprediction** rate, and the hori- zontal ...

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[Improving branch prediction by dynamic dataflow-based identification of correlated branches from a large global history](#)

R Thomas, M Franklin, C Wilkerson... - ACM SIGARCH Computer..., 2003 - dl.acm.org

... [6] went one step further, and showed that for 16-bit histories, the prediction **accuracy** is not ... the next branch, all registers that get updated in that basic block will have the last branch marked as ... **branch misprediction** is detected, speculative updates to the ARF have to be repaired. ...

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[Variable length path branch prediction](#)

J Stark, M Evers... - ACM SIGOPS Operating Systems Review, 1998 - dl.acm.org

... into the table using the last N target addresses, and using profiling information to select the proper value of N for each branch, extremely accurate ... For comparison, the gshare predictor, a predictor known for its high **accuracy**, has a conditional **branch misprediction** rate of 8.8 ...

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[The effects of predicated execution on branch prediction](#)

GS Tyson - Proceedings of the 27th annual international..., 1994 - dl.acm.org

... prediction schemes range in **accuracy** (and complexity) from simple static techniques exhibiting moderate **accuracy** (in 609ZO) to ... approach has an associated **branch misprediction** ... The **final** branch prediction strategy modeled is the two level adaptive strategy developed by Yeh ...

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[Decoupled value prediction on trace processors](#)

SJ Lee, Y Wang... - High-Performance Computer..., 2000 - ieeexplore.ieee.org

... to be delivered to the VPB even if the trace fetch is stalled due to a trace cache miss, a **branch misprediction** or an ... measure the performance based on the prediction **accuracy**, not the prediction rate because it is the prediction **accuracy** which affects the **final** performance. ...

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... Our study begins in the next section, with two **branch prediction** strategies that are often suggested. ... belonging to each of the categories are discussed, and further refinements intended to reduce cost and increase **accuracy** are presented ... Conclusions are given in the **final** section ...

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TY Yeh... - ACM SIGARCH Computer Architecture News, 1992 - dl.acm.org

... **Prediction**) that achieves substantially higher **accuracy** than any other scheme reported in the literature. The mechanism uses two levels of branch history information to make predictions, the history of the last k branches encountered, and the branch behavior for the last s oc ...

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[Two-level adaptive training branch prediction](#)

TY Yeh... - Proceedings of the 24th annual international ... , 1991 - dl.acm.org

... mo- tivation for proposing a new, higher-**accuracy** dynamic **branch prediction** scheme. The new scheme uses two levels of branch history information to make predictions. The first level is the history of the last n branches. The ...

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C Young ... - ACM SIGPLAN Notices, 1994 - dl.acm.org

... algorithm walks each individual branch history tree to determine the minimum number of unique paths necessary to maximize this **branch's prediction accuracy**. ... history_tree_node htnode) BEr31N IF htnode has no children THEN IF path ending at htnode causes **final** branch to ...

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... Different mappings often have great influ- ence on the **final** prediction **accuracy**. ... Among the various **branch prediction** schemes, two-level or correlation based predictors are among the best ... one on Markov predictors in Section 3.1.1, it can be seen that there are **strong** similarities ...

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[Branch predictor with serially connected predictor stages for improving branch prediction accuracy](#)

S McFarling - US Patent 6,374,849, 2002 - Google Patents

... This second array of counters switches between the two predictors to select one 50 for a **final** prediction. ... SUMMARY OF THE INVENTION The invention provides an improved **accuracy branch prediction** mechanism to minimize the time lost to erroneous 60 predictions that ...

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[Elastic history buffer: A low-cost method to improve branch prediction accuracy](#)

MD Tarlescu, KB Theobald... - Computer Design: VLSI in ... , 1997 - ieeexplore.ieee.org

... This section describes the Elastic History Buffer (EHB) **branch prediction** scheme. ... Finally, branches which are both **strong** d and uncorrelated may dispense with dynamic pre ... We can see that, on aver- age, the prediction **accuracy** of our scheme is within 0.5% of the upper bound ...

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[A comparison of dynamic branch predictors that use two levels of branch history](#)

TY Yeh... - ACM SIGARCH Computer Architecture News, 1993 - dl.acm.org

... We [1] intro- duced the idea of dynamically collecting two levels of branch history, branch execution history and pattern history, to achieve substantially higher **accuracy** than ... our algorithm Two-level Adaptive **Branch Prediction**. ... last k branches encountered. ...

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... of lost cycles due to speculative execution of wrong-path instruc- tions, **branch prediction** has evolved ... Finally, prediction **accuracy** for gee, go and vorre improves with more history bits but quickly ... number of mispredictions that occured the last inter- val when a history length of n ...

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... The experimental data implies that there is **strong** path locality, and that the example shown in Figure 5 is rather unusual and not the common case. 11 11 ... The TMP performs multiple **branch prediction** relying on the **accuracy** of individual tree-node predictors. ...

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Selective value predictionS. Calder, Q. Reinman... - ... 1999 - ieeexplore.ieee.org... When an instruction uses a predicted **value**, its own **register** entry is also marked as speculative, and its ... Simulation is execution-driven, including execution down any speculative path until the de- tection of a fault, TLB miss, **branch misprediction**, or load misspeculation. ...

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Pipeline processor with enhanced method and apparatus for restoring register-renaming information in the event of a branch misprediction

KC Yeager, MS Khurshid - US Patent 5,758,112, 1998 - Google Patents

... ii) Patent Number: [45] Date of Patent: 5,758,112 May 26, 1998 [54] PIPELINE PROCESSOR WITH ENHANCED METHOD AND APPARATUS FOR RESTORING REGISTER-RENAMING INFORMATION IN THE EVENT OF A BRANCH MISPREDICTION [75] Inventors: Kenneth C ...

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Method and system for minimizing branch misprediction penalties within a processor

CD Dietz, RT Golla... - US Patent 5,634,193, 1997 - Google Patents

... the present invention relates to a method and system for executing instructions within a processor such that the **branch misprediction** penalty incurred ... In some cases, the condition **register value** upon which a conditional branch depends can be ascertained prior to executing the ...

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Variable length path branch predictionJ. Stark, M. Evers... - ACM SIGOPS Operating Systems Review, 1998 - dl.acm.org... For comparison, the gshare predictor, a predictor known for its high accu- racy, has a conditional **branch misprediction** rate of 8.8% given the ... branch.) At the end of the second step, the **final** candidate that is selected for each branch is the candidate ... **register value** must be used. ...

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Improving branch predictors by correlating on data valuesTH Heil, Z. Smith, ... - Microarchitecture, 1998, MICRO- ..., 1998 - ieeexplore.ieee.org... After a **branch misprediction**, the count for each squashed branch is decremented. ... it stores its set difference in the table, and sets the valid bit for the output architectural **register**. ... with the SimpleScalar 2.0 suite [2], modified to simulate the Bi-Mode predictor, the **value** history table ...

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Dataflow analysis of branch mispredictions and its application to early resolution of branch outcomes [PDF] from psu.eduA. Percy, O. Temam, R. Espasa... - ... of the 31st annual ACM/IEEE ... 1998 - dl.acm.org... The **branch misprediction** is high be- cause the branch condition depends on table values, even though for ... Then, each time a tagged instruction is decoded, the instructions pro- ducing its **register** operands, ie, the ... We need to pre- dict at iteration i the **value** of the operands of the ...

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Reducing register ports for higher speed and lower energyI. Park, MD Powell... - ... 2002 (MICRO-35), ... 2002 - ieeexplore.ieee.org... Rename Issue Bypasses **Branch misprediction** penalty Bypass check ... However, as in a conven- tional pipeline, the bypass control logic determines that the operand should come from bypass and discards the **register value**. This lost opportunity is insignificant in practice. ...

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Branch ordering buffer

DD Boggs, S. Weiss... - US Patent 6,799,266, 2004 - Google Patents

... as well as the new physical **register** (new PREG) which will contain the new **value** for the ... to copy said shadow state to said primary state in response to a **branch misprediction** 40 being ... array and said shadow array, said history buffer to store historical physical **register** to logical ...

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The PowerPC 620 microprocessor: a high performance superscalar RISC microprocessorD. Levitan, T. Thomas... - Compcon'95: Technologies for the ... 1995 - ieeexplore.ieee.org... In the case of a **branch misprediction**, dispatch and execution resumes with the proper instruction stream. ... For a conditional branch instruction in the dispatch buffer whose condition depe on the **value** of the Count **Register**, the prediction is m based on the Count **Register value**. ...

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J Launchbury, JF Lewis... - ACM SIGPLAN Notices, 1999 - dl.acm.org

... At a **branch misprediction**, **register** mapping tables must be modified to invalidate the contents of registers that contain results of rescinded instructions. ... Without strictness, the **final value** would simply be returned, with none of the effects having been performed. ...

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Low-overhead core swapping for thermal management

E Kursun, Q. Raajegard, S Salti, A Shayesteh... - Power-Aware ... , 2006 - Springer

... The mechanism stays active until the die temperature drops below the critical **value**. ... The address predictors are moved further away from the core pipeline in the microcore. There is also a hybrid **value** predictor [24], predicting only load instructions. ...

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Method and system for changing the executable status of an operation following a branch misprediction without refreshing the operation

M Alsup... - US Patent 7,197,630, 2007 - Google Patents

Page 1. US007197630B1 (12) United States Patent a0) Patent no.: us 7,197,630

b1 Alsup et al. (45) Date of Patent: Mar. 27,2007 (54) METHOD AND SYSTEM FOR CHANGING THE EXECUTABLE STATUS OF AN OPERATION ...

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Evaluation of Core Technology

J Launchbury, JF Lewis... - 2000 - DTIC Document

... At a **branch misprediction**, **register** mapping tables must be modified to invalidate the contents of registers that contain results of rescinded instructions. The contents of registers that are possibly live must be preserved until after the branch has ... Without strictness, the **final value** ...

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System and method of implementing microcode operations as subroutines

M Alsup... - US Patent 7,694,110, 2010 - Google Patents

... PUSHA instruction specifies that eight general 30 purpose x86 registers be pushed onto a stack defined by the **value** in the ... In response to detecting the **branch misprediction**, **register** names within one or more other operations included in the first microcode subroutine may be ...

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Dependency_table_for_reducing_dependency_checking_hardware

MS Chinnakonda, TM Tran... - US Patent 6,249,862, 2001 - Google Patents

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Dependency table for reducing dependency checking hardware

MS Chinnakonda, TM Tran... - US Patent 6,108,769, 2000 - Google Patents

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(book) Exploiting short-lived values for performance and energy efficiency in high performance microprocessors

D Balkan - 2007 - books.google.com

... **Register** renaming is used to overcome false data dependencies, by mapping each dynamic instance of an ... entry indicates if the corresponding **value** is speculatively produced, or if the **value** is a ... the RF to writeback the results values they produced, and at the **final** pipeline stage ...

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